



## IDENTIFYING DATA

### Chemical oceanography I

Subject	Chemical oceanography I			
Code	V10G061V01204			
Study programme	Grado en Ciencias del Mar			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Vázquez González, Margarita			
Lecturers	Puértolas Lacambra, Begoña Sousa Castillo, Ana			
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General description	The subject "Chemical Oceanography I" aims to explain processes that take place in the marine environment, from the point of view of physical chemistry. With this objective, the behavior of systems in different media and interfaces will be studied.			
	English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English. b) tutoring sessions in English. c) exams and assessments in English.			

## Training and Learning Results

Code	
A2	Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
A4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
A5	Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
B1	Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment.
B3	Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory.
B4	Manage, process and interpret the data and information obtained both in the field and in the laboratory.
C6	Acquire the fundamentals and terminology of chemical processes.
C7	Apply to the marine and coastal environment the principles and methods used in Chemistry.
D1	Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems.
D2	Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time.

## Expected results from this subject

Expected results from this subject	Training and Learning Results			
Describe the composition and behavior of materials present in seawater.	A2 A4 A5	B1	C6 C7	D1 D2
Explain the main properties of water, electrolyte solutions and seawater from a physicochemical point of view.	A2 A4 A5	B1 B4	C6 C7	D1 D2
Recognize and interpret the transport phenomena of solutes.	A2 A5	B1 B4	C6 C7	D1 D2

Distinguish the types of estuaries based on water circulation and identify their characteristics.	A2 A5	B1	C6 C7	D1 D2
Use quantitative models to study the water circulation and calculate residence times in estuaries.	A2 A5	B1 B4	C6 C7	D1 D2
Explain the characteristics of the air-sea interface, the processes that take place and the factors that control them.	A2 A4 A5	B1	C6 C7	D1 D2
Describe the gas solubility in the seawater and apply the models to estimate gas exchange across the air-sea interface.	A2 A4 A5	B1 B4	C6 C7	D1 D2
Explain the characteristics of the seawater-solid interface, the processes that occur in it and identify the factors that determine them.	A2 A4 A5	B1 B3 B4	C6 C7	D1 D2
Interpret the properties and behavior of particulate matter and colloids present in seawater.	A2 A5	B1 B3 B4	C6 C7	D1 D2
Use appropriate experimental techniques to study the adsorption processes and apply the models at the solid-solution interface.	A2 A5	B1 B3 B4	C7	D1 D2
Explain the characteristics and composition of interstitial waters.	A2 A4 A5	B1	C6 C7	D1 D2

## Contents

### Topic

1. Composition and physicochemical properties of seawater.	Introduction. - Ion-solvent interactions. - Ion-ion interactions. - Physicochemical properties of seawater. - Salinity.
2. Transport phenomena.	- Non-ionic transport phenomena: Heat conductivity, viscosity and diffusion. - Advection-diffusion equation. - Electrical conductivity.
3. Mixing processes in coastal systems.	- Introduction. - Estuaries: Classification and types. Description. - Mixing processes in estuaries: Models. Quantitative models.
4. Liquid-gas interface.	- Interfacial thermodynamics: Surfaces and interfaces. Surface tension. Superficial excess. - Gas solubility in seawater. - Models for estimating gas exchange at the gas-liquid interface. - Nonconservative gases. - Oxygen in seawater. - Alkalinity of natural waters.
5. Solid-liquid interface	- Introduction. - Double layer. Models. - Adsorption at the solid-liquid interface: Physisorption and chemisorption. Adsorption isotherms. - Behavior of particulate and colloidal material in sea water. - Diagenesis and interstitial waters.
Laboratory experiment 1	Determination of physicochemical properties of water in the Vigo Estuary
Laboratory experiment 2	Determination of the surface tension of organic compounds and influence of related factors.
Laboratory experiment 3	Study of adsorption from solution at the solid-liquid interface.

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	35	58
Problem solving	14	28	42
Laboratory practical	15	10	25
Essay questions exam	3	12	15

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

Description
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Lecturing	Classes in which the faculty gives a global vision of the contents of the subject, focusing in a special way on the most relevant aspects and that are more difficult to understand for the students. The material will be placed in Moovi.
Problem solving	Activity where it is exposed some aspects related to the development of the topics covered in the subject, also solving problems, exercises and / or issues.
	In addition, the students must work on proposed exercises and issues, according to the guidelines established by the professor in the classes or seminars of the subject.
Laboratory practical	The students will perform different experiments in the laboratory over several sessions. In order to be able to have previous knowledge of the practices to be carried out, students will have the corresponding material in Moovi.
	After each practical lesson, students must do a questionnaire.
	Once it is finished, students will have to answer some questions related to the work developed.

### Personalized assistance

Methodologies	Description
Lecturing	Sessions in which the faculty will resolve the questions and queries of the students related to the study and / or subjects related to the subject and the activities developed during the course. Students may attend personalized tutorials to resolve doubts. It must agree in advance date and time of the tutoring.
Laboratory practical	Idem
Problem solving	Idem
Tests	Description
Essay questions exam	Idem

### Assessment

	Description	Qualification	Training and Learning Results			
Problem solving	The problems, exercises and/or questions proposed will be evaluated, according to the guidelines established by the professor in the classes or in the seminars of the subject.	20	A2 A4 A5	B1 B4	C6	D1 D2
	Attendance at the seminars is mandatory.					
Laboratory practical	In this section will be valued:  - The work carried out by the students in the laboratory. - The questionnaire done at the end of each practical lessons. - The test with questions related to the work carried out during the practical lessons. It will be done after the practical lessons, in the final test of the subject.  Attendance at laboratory experiments is mandatory.  To overcome the subject the student should reach at least 50% of the maximum possible score for this activity.	20	A2 A4 A5	B3 B4	C7	D1 D2
Essay questions exam	Written tests to evaluate skills acquired throughout the course.  It will be valued:  - A midterm exam, no eliminatory (20%)  - The final exam (40%)  The qualification will be the weighted addition of the marks for the two exams. To pass the subject, a minimum mark of 3,5 points (of 10) must be achieved.	60	A2 A4 A5	B1 B4	C6	D1 D2

### Other comments on the Evaluation

The participation of students in any of the assessment activities of the subject will involve the assignment of a grade. Regarding this point, attendance at the laboratory sessions (two or more), realization of 20% of the exercises proposed by the professor and the realization of tests will be considered.

The final grade of the subject will be the weighted addition of the marks for all the sections, provided that the required minima are reached. If the exam score is lower than required minimum, the final grade will be the one obtained for "Question exam" (60%).

The final grade, if higher than 7 points, can be standardized so that the highest mark can reach a value of up to 10 points.

### In July

In the call for the subject in July, the evaluation will be similar, maintaining the marks obtained by the students through the problems and/or issues solving during the course and the laboratory experiments.

The exams section can be repeated in July. It will be carried out a global test in which the competences acquired will be evaluated. The student must achieve a minimum mark of 3.5 points out of 10 so that the result of this test will be taken into account in the global mark of the subject. This result will substitute the marks obtained for the tests carried out during the semester.

The final grade of the subject will be the weighted addition of the marks for all the sections, as long as the required minima are reached. If this is not the case, the final mark for the subject will be the one obtained for global test multiplied by 0.6.

In case that the mark in July was lower than the one obtained in the end of semester evaluation, the official mark will be this last one.

### Global assessment option

The application for this evaluation option must be submitted in the time and manner determined by the Center, which will be published prior to the academic start. Given the experimental nature of the practices and seminars, attendance at them is mandatory to be eligible for this evaluation option. **Failure to attend the practices, with no justified cause invalidates this possibility, as well as the opportunity for extraordinary evaluation (2nd opportunity).**

**Date, time and place of exams** will be published in the official web of Marine Sciences Faculty:  
<http://mar.uvigo.es/alumnado/examenes/>

Finally, students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher's proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record.

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#### Sources of information

##### Basic Bibliography

P.W. ATKINS, "Química Física", 8ª Ed., Editorial Médica Panamericana, 2008

S. M. LIBES, "Introduction to Marine Biogeochemistry", 2ª Ed., Academic Press, 2009

##### Complementary Bibliography

I.N. LEVINE, "Principios de Fisicoquímica", 6ª Ed., Mc Graw Hill Interamericana, 2014

F. J. MILLERO, M. L. SOHN, "Chemical Oceanography", 4ª Ed., CRC Press, 2013

J. P. RILEY, R. CHESTER, "Chemical Oceanography", Academic Press, 1989

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#### Recommendations

##### Subjects that continue the syllabus

Chemical oceanography II/V10G061V01209

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##### Subjects that it is recommended to have taken before

Chemistry: Chemistry I/V10G061V01105

Chemistry: Chemistry 2/V10G061V01110